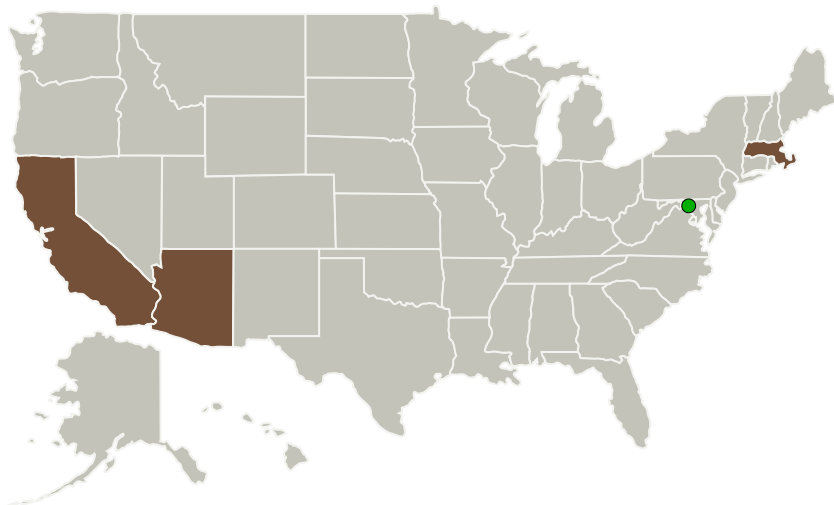## Project Introduction

Astronomers plan to use very large telescopes to take pictures of exoplanets, which are hard to see next to their bright parent stars. High contrast ($<10^{-10}$) coronagraph instruments onboard the telescope help by blocking the parent starlight so the exoplanets can be imaged. Exoplanet spectra, images taken over many wavelengths, provide information about the planet's composition and habitability. To achieve high contrast, wavefront sensing and control techniques need to be used. Natural guide stars nearby the exoplanet system are typically used to set up the wavefront sensing and control, but many natural guide stars do not provide enough signal to run the wavefront control loop fast enough to overcome instabilities and disturbances in the system. We propose to study using a space telescope architecture with external small satellite laser guide stars paired with the large telescopes to act as the reference sources. This would reduce the need design and build large telescopes with picometer stability, which would be needed if only natural guide stars were used. We will study high contrast imaging performance using the external small satellite laser guide star, as we relax the stability requirements on the large telescope.

Anticipated Benefits

Reduce cost and complexity of large aperture segmented space telescopes. Improve stability. Increase ability to do high contrast imaging. Also benefits photometric calibration. Results relevant to large space telescope study teams.

Primary U.S. Work Locations and Key Partners

Laser Guide Star for Large Aperture Segmented Space Telescopes

Table of Contents

Organizations Performing Work	Role	Type	Location
Massachusetts Institute of Technology(MIT)	Lead Organization	Academia	Cambridge, Massachusetts
Arizona State University-Tempe(ASU)	Supporting Organization	Academia Alaska Native and Native Hawaiian Serving Institutions (ANNH)	Tempe, Arizona
🟢Goddard Space Flight Center(GSFC)	Supporting Organization	NASA Center	Greenbelt, Maryland
Northrop Grumman Systems Corporation	Supporting Organization	Industry	Falls Church, Virginia

Primary U.S. Work Locations	
Arizona	California
Massachusetts	

Project Website:

https://www.nasa.gov/strg#.VQb6T0jJzyE

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Massachusetts Institute of Technology (MIT)

Responsible Program:

Space Technology Research Grants

Project Management

Program Director:
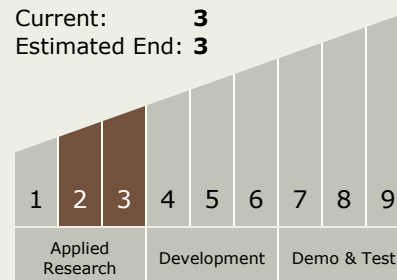
Claudia M Meyer

Program Manager:

Hung D Nguyen

Principal Investigator:

Kerri Cahoy

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**

1	2	3	4	5	6	7	8	9
	Applied Research		Development			Demo & Test		

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Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
  └ TX05.2 Radio Frequency
    └ TX05.2.6 Innovative Antennas

Target Destination

Others Inside the Solar System